

## FILE MANAGING SYSTEM

### BACKGROUND OF THE INVENTION

This application claims benefit of Japanese Patent Application No. 2000-287523 filed on September 21, 2000,  
5 the contents of which are incorporated by the reference.

This invention relates to file managing systems for managing files and, More particularly, to file managing system and method of keeping and managing computer program files or like files correlated in calls thereof to one  
10 another capable of keeping together files having the same title but different contents and filing different registers but having the same content to be Managed as a single file.

A usual file managing system for keeping and managing  
15 ordinary files usually manages individual files with file titles peculiar thereto. Where files are managed with sole file titles, it is impossible to keep a plurality of files of the same file title.

Accordingly, in a prior art file managing system,  
20 hierarchical directories are provided, and files of the same title are kept by entering them in respective directories.

Fig. 12 shows an example, in which two files 0801 and 0802 have different contents but are given the same  
25 title of tokkyo.txt. Where files are managed with sole file titles, the two files can not be managed as separate files. Accordingly, as shown in Fig. 13, two different directories of /Text/Network/ and /Text File system/ are

provided, and the two files are entered in these directories, respectively. In this way, the two files having the same title of tokko.txt can be managed together. Where directory names are incorporated in file titles, as in the case of Fig. 12 in which, for instance, /Text/Network/tokkyt.txt is provided as file title, a plurality of files having the title of /Text/Network/tokkyo.txt can not be provided. Thus, even a usual file system cannot keep together a plurality of files having the same title.

Japanese Patent Laid-Open No. 8-339321 proposes a technique for solving this problem. In this technique, files are managed not with file titles but with managing IDs. Also, a correspondence list, in which user names, file titles, version numbers, etc. are listed in correspondence to managing IDs, is provided. Thus, a desired file can be obtained by calling it with pertinent listed data shown to the called side. This method permits keeping a plurality of files having the same title so long as their user names, version numbers, etc. are different.

Fig. 14 shows a file managing system which implements the above prior art method. The system comprises a managing server 1010, a memory 1020, a file request input unit 1001, a file input unit 1002 and a file output unit 1003. The memory 1020 includes a file DB 1022 for storing files and a managing DB 1021 for keeping file managing data. Files have different IDs, and are stored in the

file DB 1022. In the managing DB 1021, as shown in Fig. 15, correlations of the IDs to types, user names, file titles, versions, etc. are stored.

A file requester inputs these input items, i.e., type, username, file title and version, to the file request input unit 1001. A managing DB retriever 1011 retrieves a managing DB 1021, and obtains a managing ID corresponding to the request items. A file retriever 1013 obtains a file corresponding to the obtained managing ID from the file DB 1022. The file output unit 1003 sends out the obtained file to the file requester.

When registering a file, the registering person inputs the file to be registered to the file input unit 1002. The file retriever 1013 produces a managing ID which is not utilized in any other file. The produced managing ID corresponds to the type, user name, file title and version of the file to be registered. A file registering/deleting part 1014 registers the file in the file DB 1022. A managing DB updating part 1012 registers the correspondence of the managing ID to the type, user name, file title and version of the file.

The above file managing system can be used for keeping computer program files. With computer program files collectively managed and commonly owned by a plurality of computer program executes, computer program versions and so forth can be readily managed. In addition, with files sent out to the computer program execution equipment when and only when required, resources therein

can be saved.

Usually, a computer program comprises a plurality of files, and the individual files provide different functions. Among files constituting different computer programs may possibly be those, which have the same title but different contents. Where such possibility is present in the use of a usual file managing system, the individual files having the same file title can be kept together by giving a unique directory to each computer or each user. Besides, by utilizing the technique disclosed in the Japanese Patent Laid-Open No. 8-339321 same title files which are different in the user, the computer program, the version, etc. can be dealt with as different files, the system operation is obtainable without any problem even in the case of presence of the same title files.

Japanese Patent No. 2864932 shows a further prior art technique. In this technique, when a newly produced file or an edited file is to be registered, a new ID number is automatically given to it, and when a file having the same ID number is present on the called side at the time of calling a file, the call-out is controlled such as to be stopped. In this technique, files are distinguished according to file titles and ID numbers, it is a preamble that files having the same content have the same ID number.

This technique thus preventing the storing or calling of a plurality of files having the same content and also distinguishing files having different contents.

When a new file is produced or when a file is updated,  
a new ID number is given. For example, computer files  
may have a constitution as shown in Fig. 2. In this example,  
computer programs A 0210 and B 0211 have been registered  
5 by different registering persons A and B. Files A 0212  
and A 0214 which have the same title but different contents,  
should be kept as separate files. On the other hand, a  
file B 0213 which is commonly used in the computer programs  
A 0210 and B 0211 should not be kept as separate files  
10 therein but should be kept as a single common file.

The above prior art, however, has the following  
problem. In a file memory which is commonly owned by a  
plurality of different users, it is impossible to prohibit  
the handling of files having the same content, if any,  
15 among files registered by a plurality of registering  
persons, as separate files (i.e., allow the handling of  
these files as a single file) while allowing the managing  
of files having the same file title but different contents  
as separate files.

20 In the technique disclosed in the Japanese Patent  
Laid-Open No. 8-339321, file titles and versions thereof  
are managed with unique managing IDs, and thus a file  
to be registered has the same file title of a file which  
has been registered can be registered. However, since  
25 files are each managed with each managing ID, even files  
having the same file title and also the same content can  
be managed as separate files. That is, a plurality of  
files having the same content may be registered as such,

and they can not be dealt with as a single file, for instance a program file common to a plurality of users.

The technique disclosed in the Japanese Patent No. 2864932, in which files are managed with different ID numbers given thereto, has a problem that files with the same ID number can not be registered, or a plurality of files having the same content can not be managed as the same file if their ID numbers are different.

#### SUMMARY OF THE INVENTION

10 An object of the invention is to provide file managing system and method capable of solving the above problems and managing of files having the same title but different contents and also managing of a plurality of files registered by respective registering persons and  
15 having the same content as a single file.

According to an aspect of the present invention, there is provided a file managing system for managing files comprising a means for managing a plurality of files having the same file title but different contents as  
20 separate files and a means for managing a plurality of files having the same content as a single file.

According to another aspect of the present invention, there is provided a file managing system for managing files, comprising: a file input unit for sending out,  
25 to a data processor, inputted files to be registered, file titles to be registered and file IDs to be registered; a file request input unit for sending out, to the data processor, an inputted file title of a requested file

and an inputted pertinent file ID; a memory unit including a correspondence table, in which correspondence relationships of file titles, file IDs and managing IDs are recorded, and a file memory, in which managing IDs and files are recorded; a data processor including a means for producing, if no file having the same content as any of the files to be registered has been recorded in the file memory, a new managing ID and recording the new managing ID and a file to be registered in the file memory, a means for retrieving the file memory with managing IDs for obtaining corresponding files, a means for sending out the retrieved file to a file outputting unit, a file content comparing means for comparing the content of a file to be registered and the contents of files registered in the file memory, a means for registering, if a same content file has been registered in the file memory, the file title of the pertinent file to be registered, the file ID thereof and the managing ID of the same content file in the correspondence table, and a means for retrieving the correspondence table; and the file output unit sending out, to the file request input unit, the file corresponding to the file title and the file ID requested from the file request input unit as delivered from the data processor.

25 According to other aspect of the present invention, there is provided a file managing system for managing files, comprising: a file input unit for sending out, to a data processor, inputted files to be registered,

file titles to be registered and file IDs to be registered;  
a file request input unit for sending out, to the data  
processor, an inputted file title of a requested file  
and an inputted pertinent file ID; a memory unit including  
5 a correspondence table, in which correspondence  
relationships of file titles, file IDs and managing IDs  
are recorded, and a file memory, in which managing IDs  
and files are recorded; a data processor including a means  
for producing a new managing ID and registering, in the  
10 file memory, the new managing ID and a file to be registered,  
a file deleting means for deleting, if a same content  
file has been registered in the file memory, the managing  
ID and the file registered in the file registering means,  
a means for retrieving the file memory with managing IDs  
15 for obtaining corresponding files, a means for sending  
out the obtained files to a file output unit, a file content  
comparing means for comparing the content of a file to  
be registered with the contents of the files registered  
in the file memory, a correspondence table registering  
20 means for registering, in the correspondence table, the  
file titles to be registered, the file IDs to be registered  
and the new managing IDs, a correspondence table updating  
means for updating, if a same content file has been  
registered in the file memory, the contents registered  
25 in the correspondence table registering means with the  
file titles to be registered, the file IDs to be registered  
and the managing ID of the same content file, and a means  
for retrieving the correspondence table; and the file



output unit sending out, to the file request input unit, the file corresponding to the file title and the file ID requested from the file request input unit as delivered from the data processor.

5           The memory unit further includes hash tables in which relationships of hash values of files and managing IDs are recorded, the data processor includes a hash table retrieving means for retrieving the hash tables with hash values of files to be registered and a hash table  
10   registering means for registering, if no same content file has been registered in the file memory, the hash values of files to be registered and corresponding managing IDs in the hash tables, and the file content comparing means compares the content of a file  
15   corresponding to a managing ID in the case of obtaining identity as a result of the retrieval in the hash table retrieving means and the content of the pertinent file to be registered.

          The hash tables are each provided for each file title,  
20   and the hash table retrieving means decides, if no same title file as the file title of the any retrieved file has been registered in the file memory, that no hash table retrieval result is present, and retrieves, if a same title file has been registered in the file memory, the  
25   hash table corresponding to the file title of the same title file with the hash value of the pertinent file to be registered used as a key value.

          Only a single hash table is provided for all file

titles.

According to still other aspect of the present invention, there is provided a file managing method for managing files, wherein a plurality of files having the same file title but different contents are managed as  
5 separate files, while also managing a plurality of files having the same content as a single file.

According to further aspect of the present invention, there is provided a file managing method for managing  
10 files comprising the steps of: inputting, by a file registering person, files to be registered, the file titles thereof and a file ID; retrieving hash tables, in which correspondence relationships of hash values of files and managing IDs are recorded, by using the hash  
15 values of the files to be registered as key values; taking out, if a managing ID is obtained as a result of the hash table retrieval, the file corresponding to the obtained managing ID from a file memory and compares the content of the taken-out file and the contents of the files to  
20 be registered; registering, if the content of the taken-out file is the same as the content of a file to be registered, the file title to be registered, the file ID to be registered and the managing ID of the taken-out file in a correspondence table; and producing, if no  
25 identity is obtained as a result of the hash table retrieval or if no same content file is detected although identity is obtained as a result of the hash table retrieval, a new managing ID, registering the new managing ID thus

produced and the corresponding file to be registered in the file memory, registering the new managing ID in the hash table with the hash value of the file to be registered used as a key value, and registering the file title to  
5 be registered, the file ID to be registered and the new managing ID in the correspondence table.

According to still further aspect of the present invention, there is provided a file managing method for managing files comprising the steps of: inputting, by  
10 a file registering person, files to be registered, file titles thereof and a file ID; producing new managing IDs corresponding to the files to be registered and registering the produced managing IDs and the files to be registered in a file memory; registering file titles  
15 to be registered, a file ID to be registered and the new managing IDs in a correspondence table; retrieving hash tables, in which correspondence relationships of hash values of files and managing IDs are recorded, by using the hash values of the files to be registered as key values;  
20 retrieving, when a managing ID is obtained as a result of the hash table retrieval, the file memory to take out the file corresponding to the obtained managing ID and comparing the content of the taken-out file and the contents of the files to be registered; updating, if the  
25 content of the taken-out file is the same as a file to be registered, the new managing ID registered in the correspondence table to the managing ID corresponding to the taken-out file, and deleting the new managing ID

registered in the file memory and the files to be registered from the file memory; and registering, if no identity is obtained as a result of the hash table retrieval or if no same content file is detected although identify is obtained as a result of the hash table retrieval, the  
5 new managing ID in the hash table with the hash values of the files to be registered as key values.

The hash tables are each provided for each file title, in the hash table retrieval each hash table is retrieved  
10 for any file having the same file title as a file to be registered, decides, if no same title file has been recorded, that no retrieval result is present, and retrieves, if a same content file has been recorded, the hash table corresponding to the file title of the same  
15 title file with the hash value of the file to be registered used as a key value.

The hash table is provided for all of file titles.

According to other aspect of the present invention, there is provided a file managing method for managing  
20 files comprising the steps of: inputting, by a file requester, the file title of a desired file and the corresponding file ID; retrieving a correspondence table, in which file titles, file IDs and managing IDs are recorded, with the inputted file title and file ID; obtaining, from  
25 the correspondence table, the file title corresponding to the inputted file title and file ID and a managing ID corresponding to the inputted file ID; retrieving a file memory, in which managing IDs and files are recorded,

with the obtained managing ID; obtaining, for the file memory, a file corresponding to the obtained managing ID; and sending out the obtained file as the desired file to the file requester.

5           Other objects and features will be clarified from the following description with reference to attached drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

10           Fig. 1 shows a first embodiment of the file managing system according to the present invention

          Fig. 2 is a drawing for explaining the file title overlapping and file common use in a plurality of computer programs;

15           Fig. 3 shows an example of correspondence table;  
          Figs. 4(a) and 4(b) show an example of hash table;  
          Fig. 5 is a flow chart illustrating the operation when registering a new file;

          Fig. 6 is a flow chart illustrating the operation when requesting a file;

20           Fig. 7 is a flow chart illustrating the operation of the second embodiment when registering a new file;

          Fig. 8 shows an example of the file memory 0123;

          Figs. 9(a) to 9(c) are views for describing the example when registering files;

25           Figs. 10(a) to 10(c) are views for describing a specific example of the operation when registering files;

          Figs. 11 shows an example of hash table;

          Fig. 12 shows an example, in which two files have

different contents but are given the same title;

Fig. 13 shows an example of directory structure in general file system; and

Fig. 14 shows a prior art file managing system.

5 PREFERRED EMBODIMENTS OF THE INVENTION

Preferred embodiments of the present invention will now be described with reference to the drawings.

Fig. 1 shows a first embodiment of the file managing system according to the invention. The illustrated  
10 system comprises two different input units, i.e., a file request input unit 0101 and a file input unit 0102, a data processor 0110 for processing the inputs to the two input units, a memory 0120 for keeping a list of files and data thereof, and a file output unit 0103 for sending  
15 out files in response to file requests.

Generally, the file request input unit 0101, the file input unit 0102, the file output unit 0103 and the data processor 0110 each have a communicating function, are inter-connected via a network. File registering  
20 persons and file requesters cause the input and output of data to and from the file managing system according to the invention via the network.

The file request input unit 0101 is used by file requesters. A file requester can input the file title  
25 of a desired file and a file ID given to him or her via the file request input unit 0101 to the data processor 0110. To the file input unit 0102, a file register inputs a file to be registered together with the corresponding

file title and file ID. The inputted file, file title and file ID are sent out to the data processor 0110. The file output unit 0103 outputs a file complying with the file request to the file requester.

5           The data processor 0110 includes a correspondence table retriever 0111 and a correspondence table updating part 0112 which correspond to a correspondence table 0121, a hash table retriever 0113 and a hash table updating part 0114 which correspond to a hash table 0122, a file retriever 0115 and a file registering/deleting part 0116 which correspond to a file memory 0123, and a file content comparing part 0117. The correspondence table 0121, the hash table 0122 and the file memory 0123 together constitute a memory unit 0120.

10           In the correspondence table 0121, file titles, file IDs and managing IDs corresponding to files are recorded. In an example shown in Fig. 3, three files having a file title of "file A" are registered. These files are registered with file IDs of "usr001.prog01",  
15           "usr001.prog02" and "usr002.prog01", respectively, and correspond to managing IDs of "A-1", "A-2" and "A-1", respectively. The file with the file ID of "usr001.prog01" and the file with the file ID of "usr001.prog02" correspond to different managing IDs,  
20           and are thus recognized to be files which have the same file title but different contents. The file with the file ID of "usr001.prog01" and the file with the file ID of "usr002.prog01" correspond to the same managing ID, and  
25

are thus regarded and handled as a single file because their contents are the same.

The correspondence table retriever 0111 provides a function of retrieving the correspondence table 0121 with file titles and file IDs to obtain corresponding managing IDs. It is also possible to cause retrieval of the table by designating the sole file title. The correspondence table updating part 0112 provides a function of registering the correspondence relationship of new file title, file ID and managing ID in the correspondence table 0121 or updating a registered correspondence relationship.

The hash table 0122 is provided for each file title. A numerical value having a certain length (i.e., hash value) is calculated from a byte array of a file itself (i.e., file substance). This value (i.e., hash value) is referred to as key value, and is recorded in a table, in which the managing ID of the pertinent file is recorded.

Figs. 4(a) and 4(b) show an example of hash table. Referring to Fig. 4(a), three files 0401, 0402 and 0403 are registered as files having a file title of "file A". These files 0401, 0402 and 0403 have different contents of Func A, Func B and Func C, respectively. Because of their different contents, these files have different managing IDs. Fig. 4(b) shows a hash table 0122 with the file title of "file A" which is produced from the above files. In this example, the key values in the hash table 0122 obtained from the files 0402 and 0403 are the same.



In this case, the hash table retriever 0113 obtains two managing IDs of "A-2" and "A-3" by retrieving the hash table 0122 with either of the hash values of the files 0402 and 0403. It will be seen that a managing ID obtained  
5 by retrieving the hash table 0122 may not be the same as that of a file used for the retrieval. However, the key values (or hash values) calculated from files having the same content are always the same. That is, where files having the same content are among registered files, files  
10 having the same content are always present among files having managing IDs obtained as a result of retrieval of the hash table 0122. In other words, by retrieving the hash table 0122 with the hash value of a file, it is possible to obtain a file or files having the same  
15 content as the used file. Using the hash table 0122 makes it unnecessary to compare the file content with all the files having the same file title, thus greatly reducing the time necessary for the file content comparison.

The hash table retriever 0113 provides a function  
20 of retrieving the hash table 0122 by using a hash value obtained from a file as a key value to obtain a managing ID corresponding to the key value. The hash table updating part 0114, when given a file and the corresponding managing ID, calculates the key value (or hash value) in the hash  
25 table corresponding to the given file, and registers the correspondence relationship between the key value and the given managing ID in the hash table 0122. The hash table updating unit 0114 also has a function of deleting

a given managing ID from the hash table. The file memory 0123 provides a function of stopping the file itself (i.e., file substance) by using the corresponding managing ID.

The file retriever 0115 provides a function of  
5 retrieving the file memory 0123 for a file corresponding to a given managing ID. The file retriever 0115 also provides a function of producing a new managing ID for a file to be registered. The file retriever 0115 further has a function of sending out a retrieved file to the  
10 file output unit 0103. The file registering/deleting part 0116 provides a function, when given a file and the corresponding managing ID, of registering the given file in the file memory 0123 with the given managing ID or deleting a registered file from the file memory 0122 with  
15 the given managing ID. Fig. 8 shows an example of the file memory 0123. The file content comparing part 0117 compares the content of a file to be registered and the content of the files registered in the file memory 0123.

This embodiment of the file managing system manages  
20 files with managing IDs and file IDs. The managing ID is an ID (identifier) for identifying a file preserved in the file memory 0123. Although a managing ID given to each file is not specified here, a peculiar managing ID is given as, for instance, "file title + serial number"  
25 to each file preserved in the file memory 0123. The file ID is a value for identifying a file registering person or a file requester. Files having different file IDs can be handled as separate files even if they have the same

file title so long as they have different contents. The file IDs of different registering persons should be different. Also, when registering files constituting a plurality of different computer programs, some of such  
5 computer programs may have files which have the same file title but different contents. Such same title files can be handled as separate files by giving different file IDs to them. This means that it is necessary that a registering person can own a plurality of file IDs. The  
10 file ID is not specified here, but it conceivably has a form of, for instance, "register @ computer program". This form of the file ID has a meaning that its part concerning the registering person is predetermined to have an absolute sense among registering persons while  
15 each registering person can freely handle its part concerning the computer program. Also, it is possible to use different file IDs among users and among computer programs by utilizing as means for automatically allotting new file IDs which are not in use.

20 The operation of the first embodiment of the invention will now be described with reference to the drawings.

First, the operation in the case of registering a new file will be described with reference to Figs. 1 and  
25 5. Fig. 5 is a flow chart illustrating the operation when registering a new file. Referring to Fig. 5, a file registering person inputs a file and a file ID which is used when calling out that file to the file input unit

0102 (step 0501).

The correspondence table retriever 0111 then retrieves the correspondence table 0121 for any file having the same file title as the file to be newly registered (step 0502). Thus, a check can be done as to whether any file having the same file title has been registered. If a same title file has been registered (step 0503), a check is done as to whether the registered file and the file to be newly registered are the same or different in the content.

Specifically, the hash table retriever 0113 retrieves the hash table 0122 corresponding to the file title of the file to be newly registered by using the hash value of the file (step 0504). If an identical key value fails to be obtained as a result of the retrieval, it means that no registered file having the same file title and the same content as the file to be newly registered is present.

If the identical key value is obtained as a result of the retrieval (step 0505), it is possible that a file having the same content as the file to be newly registered is present as file having the managing ID corresponding to that key value. Thus, file content comparison is then done. Specifically, the file retriever 0115 retrieves the file memory 0123 to take out a file or files having the managing ID corresponding to the identical key value detected in the step 0504. The file content comparing part 0117 compares the contents of all the taken-out files

with the content of the file to be newly registered (step 0506).

If any file having the same content is detected (step 0507), such file and the file to be newly registered are  
5 handled as a single file. That is, the file to be newly registered is not registered in the memory unit 0120, but the file corresponding to the given file ID is made to be the file obtained in the step 0506 (i.e., registered file having the same content as the file to be newly  
10 registered). Also, the managing ID corresponding to the given file ID is made to be the managing ID of the registered same content file step 0511).

If no same title file is detected in the step 0503, if no identical key value is obtained in the step 0505  
15 or if no same content file is detected in the step 0507, the file to be newly registered should be registered as such in the file memory 0123. To this end, the file retriever 0115 first retrieves the file memory 0123 to obtain a new managing ID not used in any other file. The  
20 new managing ID is made to be the managing ID of the file to be newly registered and correspond to the given file ID (step 0508).

The file registering/deleting part 0116 registers the file to be newly registered in the file memory 0123  
25 with the new managing ID (step 0509). The hash table updating part 0114 registers the new managing ID in the hash table 0122 with the hash value of the newly registered file as a key value (step 0510). After the step 0511 or

the step 0510, the correspondence table updating part 0112 registers the correspondence relationship of the registered file ID and the managing ID related thereto in the step 0511 or the step 0508 in the correspondence  
5 table 0121 (step 012).

Now, the operation in the case of requesting a file will be described with reference to Figs. 1 and 6. Fig. 6 is a flow chart illustrating the operation when requesting a file.

10 Referring to Fig. 6, a file requester inputs the file title of the request file and the file ID allotted to him or her to the file request input unit 0101 (step 0601). The correspondence table retriever 0111  
15 retrieves the correspondence table 0121 for the inputted file title and the managing ID corresponding to the inputted file ID (step 0602). If the corresponding managing ID fails to be obtained, an error indicating that no corresponding file has been registered is  
20 outputted in lieu of any file to the file output unit 0103 (step 0604). If the corresponding managing ID is obtained, the file retriever 0115 takes out a file corresponding to the obtained managing ID from the file memory 013 (step 0605). The obtained file is outputted  
25 as a file having the inputted file title to the file output unit 0103 (step 0606). The file output unit 0103 sends out the file to the file requester.

As an example of form of use, a file requester is given only a single file ID. A file registering person

registers all the files utilized by the single file requester with the same file ID. For example, when registering computer program files, all the files constituting a computer program are registered with a single file ID. Thus, a person who executes this computer program, i.e., the file requester requesting the files of this computer program can obtain all the files of the computer program by showing the single file ID every time he or she requests a file.

10 The operation of the data processor 0110 and the memory unit 0120 in the first embodiment will now be described in greater details in connection with a specific example.

15 The operation when registering files will first be described with reference to Figs. 5 and 9(a) to 9(c). Figs. 9(a) to 9(c) are views for describing the example when registering files.

20 In this example, it is assumed that the files A 0212, B 0213 and C 0215 constituting the computer program A 0210 shown in Fig. 2 have already been stored with a file ID of "usr001.prog01". Fig. 9(b) shows the correspondence table, the hash table and the file memory at this time. It is intended to register, in this state, the files A 0214, B 0213 and D 0219 constituting the computer program shown in Fig. 2 with a file ID of "usr002.prog01" (see Fig. 9(a)).

In the first place, the files A 0314, B 0213 and D 0216 as files to be registered are inputted together

with the file ID "usr002.prog01" in the file input unit 0102 (step 0501). The correspondence table retriever 0111 checks whether any file of the same file title as any one of the files A 0214, B 0213 and D 0216 has been  
5 registered (step 0502). As for the file D 0216, no same title file is present. A check is thus made as to whether any file having the same content as any one of the registered files A 0214 and B 0213 having the same file title is present.

10 The hash table retriever 0113 retrieves the hash table with the hash values of the files A 0214 and B 0213 used as key values (step 0504). As for the file A 0214 no same content file is detected, but as for the file B 0213 a file having a managing ID of "file B-1" is detected  
15 (step 0505). By merely detecting a file with the hash table, it cannot be distinguished whether the detected file really has the same content or the key value of the hash table as calculated from the detected file is only accidentally identical. Accordingly, the file retriever  
20 0115 takes out the file having the managing ID of "file B-1" from the file memory 0123. The file content comparing part 0117 compares the contents of the taken-out file and the file B 0213 to be registered (step 0506).

Here, the two compared files have the same content.  
25 Thus, the file having the file title of "file B" and the file ID of "usr002.prog01" is given a managing ID of "file B-1" (step 0511). As for the files A 0214 and D 0216 without any registered same content file, new files should be



registered.

First, the file retriever 0115 produces new managing IDs not used in any other file. Here, managing IDs of "file A-2" and "filer D-1" are allotted to the files A 0214 and D 0218, respectively. The file registering/deleting part 0116 then registers A 0214 and D 0216 in the file memory 0123 with the managing IDs of "file A-1" and "file D-1", respectively (step 0509). As a result, two new rows 1207 and 1208 are additionally provided in the file memory 0123. The hash table updating part 0114 then registers the correspondence relationship of the files A 0214 and D 0216 and the managing IDs of "file A-2" and "file D-1" to one another in the hash tables (step 0510). Thus, new rows 1209 and 1210 are additionally provided to the hash tables.

Finally, the correspondence table updating part 0112 registers the correspondence relationship of the managing IDs given to the files A 0214, B 0213 and D 0216 and the file IDs of "usr002.prog01" given at the time of the registration to one another in the correspondence table 0121 (step 0512). As a result, new rows 1211, 1212 and 1213 are additionally provided to the correspondence table. The correspondence table, the hash tables and the state of the file memory when the registration has been ended are as shown in Fig. 9(c).

Now, the operation when requesting a file will be described with reference to Figs. 6 and 9.

When requesting a file, the pertinent file title

and file ID are inputted to the file request input unit 0101 (step 0601). Taking the result shown in Fig. 9(c) for example, by requesting a file with the file title of "file A" and the file ID of "usr001.prog01", the  
5 correspondence table retriever 0111 retrieves the correspondence table 1204 (step 06032), and returns the corresponding managing ID of "file A-1". The file retriever 0115 retrieves the file memory 1206 to obtain the managing ID of "file A-1" (step 0605), and the file  
10 output unit 0103 outputs the obtained file A 0212 (step 0606).

A second embodiment of the invention will now be described. It is estimated that the process of comparing file contents takes relatively long time. Accordingly,  
15 a system is desired, in which a file can be sent out as soon as its request received even during registration by checking for files having the same contents as those of newly registered files.

The second embodiment is different from the first  
20 embodiment in that a file can be sent out as soon as its request is received even during registration by checking for files having the same contents as those of newly registered files.

The operation of the second embodiment will now be  
25 described in connection with the case of registering a new file with reference to Figs. 1 and 7. Fig. 7 is a flow chart illustrating the operation of the second embodiment when registering a new file.

Referring to Fig. 7, a step 0701 is the same as the step 0501 shown in Fig. 5. The file retriever 0115 retrieves the file memory 0123 to obtain a new managing ID not used for any other file. The new managing ID is made to be the managing ID of the file to be registered and also the managing ID corresponding to the file ID to be registered (step 0702). The file registering/deleting part 0116 registers the file to be registered in the file memory 0123 with the managing ID (step 0703).

The correspondence table updating part 0112 registers the correspondence relationship between the file ID to be registered and the managing ID (step 0704). That is, the same operation as in the steps 0508, 0509 and 0512 shown in Fig. 5 is executed. At this time, a file requested for registration can be sent out. Subsequently, a check is made as to whether any file having the same content as the file to be registered is present. If any such file is present, common operation is executed. Specifically, the operation of steps 0705 through 0710 is the same as the steps 0502 through 0507 shown in Fig. 5. However, if no same title file is detected in the step 0706, if no file can be obtained as a result of the reference to the hash tables in the step 0708 or if no same content file is detected in the step 0710, the same operation as in the step 0510 shown in Fig. 5 is executed, and the managing ID obtained in the step 0702 is registered in the hash table with the hash value of the file used as

a key value, thus completing the registration of the file (step 0711).

When a same content file is detected in the step 0710, the same operation as in the steps 0511 through 5 0512 shown in Fig. 5 is executed. The managing ID corresponding to the given file ID is made to be the managing ID of the same content file already registered (step 0712), and the managing ID registered in the step 0704 is updated to the managing ID of the same content file already 10 registered (step 0713). Subsequently, the file registering/deleting part 0116 deletes the files registered in the file memory 0123 together with the managing IDs of these files (step 0714).

A specific example of the second embodiment will 15 now be described in details with reference to Figs. 7 and 10(a) to 10(c). It is assumed that the memory unit 0120 before the registration is in the state shown in Fig. 9(b), and the example shown in Fig. 9(a) used in the description of the specific example of the first 20 embodiment are used as files to be newly registered.

Figs. 10(a) to 10(c) are views for describing a specific example of the operation when registering files. When the files are inputted, new managing IDs are obtained, and then the inputted files are registered. Here, 25 managing IDs of "file A-2", "file B-2" and "file D-1" are given for the files A 0214, B 0213 and D 0216, respectively (step 0702).

The file registering/deleting part 0116 registers

the files in the file memory 0123 with the managing IDs thus obtained (step 703). As a result, new rows 1301, 1302 and 1303 are additionally provided to the file memory (see Fig. 10(c)). Then, the correspondence table

5 updating part 0112 registers the combination of the correspondence relationship of the file titles of "file A", "file B" and "file D" and the file ID of "usr002.prog01", and the managing IDs of "file A-2", "file B-2" and "file D-1" in the correspondence table 0121 (step 0704). As

10 a result, new rows 1304, 1305 and 1306 are additionally provided to the correspondence table (see Fig. 10(a)). Thereafter, the same operation as in the case of the first embodiment is executed. In this case, however,

15 concerning the file D 0216 without any same title file and the file A 0214 without any same content file among the registered files, it is unnecessary to update the correspondence table and the contents registered in the file memory in the steps 0702 through 0704. Thus, the hashtable updating part 0114 registers the correspondence

20 relationship of the hash value of the file A 0214 and the managing ID of "file A-2" and also the correspondence relationship of the hash value of the file D 0216 and the managing ID of "file D-1" in hash tables, respectively (step 0711). As a result, new rows 1307 and 1308 are

25 additionally provided to the hash tables (see Fig. 10(b)).

As for the file B 0213, which is found in the step 0710 such that a same content file B (with the managing ID of "file B-1") has been registered, the managing ID

of the registered same content file is made to be the managing ID corresponding to the given file ID (step 0712), and the managing ID of "file B-2" corresponding to the file ID of "usr002.prog01" is updated to "file B-1" with the file title of "file B" registered in the correspondence table in the step 0704 (step 0713). Subsequently, the file registering/deleting part 0116 deletes the file B with the managing ID of "file B-2" registered in the file memory 0123 in the step 0703 (step 0714).

The final result obtained is thus the same as the correspondence table, the hash tables and the file memory state shown in Fig. 9(c) as the result of the specific example described before in connection with the first embodiment.

A third embodiment of the invention will now be described. In the previous first and second embodiments, it is assumed that same content files also have the same file title. However, files which do not have any same file title but have the same content may be present. These files also can desirably be handled as a single file. The third embodiment is different from the first and second embodiments in that files which do not have any same file title but have the same content can be handled as a single file.

The third embodiment has the same construction as shown in Fig. 1. However, for permitting files having different file titles to be handled as a single file so long as the content is the same, the hash tables 0122

are not each provided for each file title, but a single hash table is provided for all the file titles (see Fig. 11).

As for the registration of files, this embodiment  
5 is different from the examples concerning Figs. 5 and 7. In the cases of Figs. 5 and 7, a same title file check is done after inputting file ID and files. In this embodiment, no file title is used for the same content file check. Thus, the same title file check in the steps  
10 0502 through 0503 shown in Fig. 5 is not done, but after inputting file ID and files in the step 0501 the same content file check in the step 0501 is done, that is, the hash table is retrieved for hash values of files which are identical with key value. The operation subsequent  
15 to the step 0504 is the same as in the case of Fig. 5. In connection with Fig. 7, the same title file check in the steps 0705 through 0706 is not done. Instead, after recording the correspondence relationship of the managing IDs, the file titles and the file ID in the step 0704,  
20 the same content file check in the step 0707 is done, that is, the hash table retrieval with the hash value of the files as key values is done. The operation subsequent to the step 0707 is the same as in Fig. 7. The operation of requesting a file is the same as in Fig.  
25 6.

As has been described in the foregoing, the present invention has advantages that, in a file managing system which is common to pluralities of file registering persons

and file requesters, files having the same file title  
can be readily and efficiently managed. Thus, a file  
registering person does not need to avoid using the same  
file title as that of other registering persons, and also  
5 the file managing system can avoid waste of resources.  
This is so because of the provision of the means, which  
can manage files having the same file title as separate  
files so long as the files have different contents, and  
also the means, which can handle files having the same  
10 content as a single file even if the files have been  
registered by different persons and commonly uses  
resources in the file memory.

Changes in construction will occur to those skilled  
in the art and various apparently different modifications  
15 and embodiments may be made without departing from the  
scope of the present invention. The matter set forth in  
the foregoing description and accompanying drawings is  
offered by way of illustration only. It is therefore  
intended that the foregoing description be regarded as  
20 illustrative rather than limiting.